**PATENT APPLICATION
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OPTIMIZATION OF A FLEET OF OUTPUT DEVICES

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OPTIMIZATION OF A FLEET OF OUTPUT DEVICES

FIELD OF THE INVENTION

5   This invention relates in general to optimization of a fleet of output devices and, more particularly, to optimizing the fleet using historic data.

BACKGROUND OF THE INVENTION

Network printers have been utilized for several years. Each network
10   printer communicates with a network of print clients. The print clients direct print jobs to the network printers where the print jobs are processed and output.

A frequent occurrence is that the printing load is unbalanced. For instance, one or more printers is underutilized while other printers are over-burdened with print jobs. It is desirable to balance the printing load so that the
15   most effective use is made of the network printers.

One conventional solution for balancing the printer load is to track the load of each printer and route each printer job to the most desirable printer. An expected print time for each printer may be calculated and then the job delivered to the output device having the lowest expected print time. One drawback to
20   this approach is that a decision must be made for each print job. Additionally, the workload status of each printer must be monitored.

SUMMARY OF THE INVENTION

According to principles of the present invention, output device utilization
25   on a network is optimized. Utilization information for each output device is tracked. The utilization information is analyzed for optimization opportunities. The network is configured to exploit the optimization opportunities.

According to further principles of the present invention, the utilization information is tracked by periodically retrieving the utilization information and
30   archiving the retrieved utilization information. The utilization information is

selectively tracked from network print clients, network print servers and network output devices.

According to further principles of the present invention, the utilization information is analyzed by selectively searching for underused and overused

5   output devices. The utilization information is analyzed for optimization opportunities by applying rules to the utilization information. The rules are applied to the utilization information by selectively optimizing for lowest cost, highest quality, soonest output and output closest to an originated print client.

According to further principles of the present invention, the network is

10   configured by selectively configuring network print clients, network print servers and network output devices.

DESCRIPTION OF THE DRAWINGS

Figure 1 is a block diagram representing one embodiment of the system

15   of the present invention for posting a document.

Figure 2 is a flow chart illustrating one embodiment of the method of the present invention for posting a document.

Figure 3 is a diagrammatic illustration representing one embodiment of the system and method of the present invention for posting a document.

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DETAILED DESCRIPTION OF THE INVENTION

Illustrated in Figure 1 is a network 2 including a fleet 4 of at least one output device 6. Network 2 further includes at least one print client 8, at least one print server 10 and at least one controller 12. For clarity, this description

25   will generally refer to only one of each of these components 6, 8, 10 of network 2.

Output device 6 is any device that produces output onto print media. Examples of output device 6 include a printer, a copier, a facsimile machine and a multifunction device.

Print client 8 is any device or system, such as a specific or general purpose computer, that includes a means, such as a processor, for processing executable code.

Print server 10 is any device or system acting as a server for output
5   device 6. Server 10 receives print jobs from print client 8 and posts then to output device 6.

Accessible by each of output device 6, print client 8, and print server 10 is utilization information 14 for output device 6. It is anticipated that utilization information 14 will include different information about each of output device 6,
10   print client 8, and print server 10. For example, utilization information 14 on output device 6 may include information concerning actual pages printed and other information easily recordable by output device 6. Utilization information 14 on print client 8 may include information the number of print jobs originating from print client 8 directed to output device 6 and other information easily
15   recordable by print client 8. Utilization information 14 on print server 10 may include the number of print jobs routed to through print server 10 to output device 6.

Controller 12 is any combination of hardware and executable code for controlling the optimization of fleet 4 of output devices 6. Controller 12 is
20   embodied on any of output device 6, client 8, server 10, or some other device. Controller 12 includes monitor 16, inspector 18, administrator 20, utilization information 22 and, optionally, storage device 24, rules 26 and user directory 28. While Figure 1 illustrates controller 12 embodied in a single device, controller 12 may alternatively be embodied in multiple separate devices.
25   Utilization information 22 is aggregated historical utilization information 14 retrieved from output device 6, print client 8 and print server 10.

Monitor 16 is any combination of hardware and executable code configured to track utilization information 14 for each output device 6. Specifically, monitor 16 may be configured to track utilization information 14 by

selectively tracking from network print clients 8, network print servers 10 and network output devices 6.

In one embodiment, monitor 16 includes retriever 30 and utilization log 32. Retriever 30 is any combination of hardware and executable code

5   configured to periodically retrieve the utilization information 14. Utilization log 32 is any combination of hardware and executable code configured to archive the retrieved utilization information 14.

Inspector 18 is any combination of hardware and executable code configured to analyze the utilization information 22 for optimization

10   opportunities. In one embodiment, inspector 18 includes investigator 34. Investigator 34 is any combination of hardware and executable code configured to search selectively for underused and overused output devices 6.

In an embodiment non-conflicting with the previous example, inspector 18 includes manager 36. Manager 36 is any combination of hardware and

15   executable code configured to apply rules to the utilization information 22. In one embodiment, manager 36 includes optimizer 38. Optimizer 38 is any combination of hardware and executable code configured to selectively optimize for lowest cost, highest quality, soonest output and output closest to an originating print client 8.

20   Administrator 20 is any combination of hardware and executable code configured to configure network 2 to exploit the optimization opportunities. Specifically, administrator 20 may be configured to configure network 2 by selectively configuring network print clients 8, network print servers 10 and network output devices 6.

25   Storage device 24 is any device for storing data or executable code. Each of monitor 16, inspector 18, administrator 20, utilization information 22, rules 26 and user directory 28 may be stored on storage device 24. Storage device 24 may also be a program storage device tangibly embodying a program, applet or instructions executable by controller 12 for performing the method

30   steps of the present invention executable by controller 12. Storage device 24

may be any type of storage media such as magnetic, optical or electronic storage media. Although depicted as integral to controller 12, storage device 24 is alternatively embodied separate from controller 12 and accessible by controller 12.

5   Rules 26 are any directives for guiding the optimization of fleet 4 of output devices 6. For example rules 26 may require optimization for lowest cost, highest quality, soonest output or output closest to an originating print client 8.

User directory 28 is any index of authorizations for print clients 8 to

10   output devices 6. For example, user directory 28 may allow one subset of clients 8 access to a subset of output devices 6 and another subset of clients 8 access to a different subset of output devices 6.

Figure 2 is a flow chart representing steps of one embodiment of the present invention. Although the steps represented in Figure 2 are presented in a

15   specific order, the present invention encompasses variations in the order of steps. Furthermore, additional steps may be executed between the steps illustrated in Figure 2 without departing from the scope of the present invention.

Figure 3 is a diagram combining portions of Figures 1 and 2 in order to further illustrate one embodiment of the present invention. Figures 2 and 3 are

20   discussed together.

Utilization information 14 for each output device 6 is tracked 40. In one embodiment, utilization information 14 is tracked 40 by periodically retrieving the utilization information and archiving the retrieved utilization information 14. The utilization information 14 is selectively tracked 40 from network print clients

25   8, network print servers 10 and network output devices 6.

Utilization information 22 is analyzed 42 for optimization opportunities. In one embodiment, utilization information 22 is analyzed 42 by selectively searching for underused and overused output devices. In a non-conflicting alternate embodiment, utilization information 22 is analyzed 42 for optimization

30   opportunities by applying rules 26 to utilization information 22. Rules 26 are

applied to utilization information 22 by selectively optimizing for lowest cost, highest quality, soonest output and output closest to an originated print client.

Network 2 is configured 44 to exploit the optimization opportunities. Network 2 is configured 44 by selectively configuring network print clients 8, network print servers 10 and network output devices 6.

The foregoing description is only illustrative of the invention. Various alternatives and modifications can be devised by those skilled in the art without departing from the invention. Accordingly, the present invention embraces all such alternatives, modifications and variances that fall within the scope of the appended claims.